Tanta University
Faculty of Engineering
Mechanical Power Department

Hydraulic Systems Design And Automatic Control

(Mobile Forklift Truck)

Volex Gabelstapler

Das Model Von Tanta Uni.



Under Supervision

Dr./ Omar Mehrez

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For Omar Mehrez, Friend and Guide

Thanks to our elder brother and project manager, Dr/Omar, the assistant professor in the mechanical power department for all things, for leading and encouraging us, Wishing him more success through his career, and better life.

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Abstract

Today's demand on forklift trucks performance and efficiency is high. The productivity is important but also the experience while handling the forklift. The handling has to be simple and genuine to make the driver feel confident and safe. To achieve high performance steering in articulated trucks, a hydraulic power system is often used.

Simulation software are a powerful tool in development processes. The program gives the industry a possibility to develop, analyze and evaluate constructions and models more efficient.

The purpose of this master thesis is to identify and increase the knowledge about the main challenges in the hydraulic steering system in an articulated forklift. The hydraulic system has been modelled in the simulation software and validated against data from measurements performed on the forklift. The different challenges have been identified based on tests and the simulation results. For a deeper understanding of the system a literature study, mainly about the key components, has been done during the master thesis.

A number of suggestions for improvement have been developed with focus on increasing the steering performance. The concepts and ideas have been evaluated and tested in the simulation model.

The project resulted in a validated simulation model of the articulation and a number of suggested improvements on the hydraulic steering system.

This project introduces a compact-size, remotely-controlled, and hydraulically-based actuated forklift truck. Considering these features together produces a unique forklift design compared to the most commonly exist ones .

The proposed design of the truck consists mainly of two parts: the base and the mast. The base consists of two parts connected to each other by a universal joint that controls the truck direction through a steering

mechanism. The mast, the part interacts with the load is fixed to the front part of the base and is hydraulically actuated.

The mast is capable of moving along the two Cartesian coordinates (X,Z) in addition to the rotation around Y-axis (the traverse coordinate) as a result of a tilting mechanism, as shown in the attached below .

The required pressure for the hydraulic circuits is provided by a positive displacement pump of gear type and electrically derived by an electric motor . The steering and hydrostatic transmission responsible for moving the truck according to a specified direction and velocity, and those for lifting, tilting and displacing the load .

The main advantage of this project is the remote control of the truck using a programmed Arduino microchip in interface with all electrical components.